Introduction to the Course

Distributed Systems L-A

Sistemi Distribuiti L-A

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Ingegneria Due

Alma Mater Studiorum—Università di Bologna a Cesena

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Computational Systems

What is a computational system?

- any system with computational capabilities
- how many computational systems today in this room?
  - how many a few years ago?

Interactivity & Interoperability

- Almost any computational system of today comes equipped with ICT technologies for interacting with other computational systems
- We live immersed in a sort of *computational cloud*, where an incredible (and always increasing) number of computations are performed at every instant
  - distributed, concurrent computations
  - either controlled / triggered, or autonomous computations

Pervasiveness of Computational Systems

Nowadays, computational systems...

- ...have become *pervasive*
- ...are at the core of *most* artificial systems

The physical nature of artificial systems...

...adds complexity to computational components / systems

- in terms of physical *distribution*
- in terms of temporal *distribution*
- in terms of *unpredictability* of the scenarios

On the Notion of Distribution

What is distributed?

- computational units, communication channels...
- data, information, knowledge
  - as well as their representations
- sensors, actuators, ...
  - the boundaries between the systems and the surrounding environment are topologically sparse

Spatio-temporal unity of systems is lost

- there is no longer a notion of *system time*, nor a system *location*
- system components, at different level of abstraction, are only *partially related*
  - temporally & topologically

What has Changed?

A number of assumptions over systems no longer hold

- system events *no longer* constitute a totally-ordered set
  - generally speaking, partial ordering is the only feature
- admissible interactions among system components *no longer* depend on compresence
  - in space / time
  - within a physical / virtual topology

Goals of the Course

Students of this course should

- Learn the basics of distributed systems
- Take a look at some of the hottest new trends
- Experiment with coordination-based technologies
  - as a general-purpose approach to advanced technologies for distributed computational systems
- Possibly, experiment with web-based technologies
  - as a relevant case of today widespread distributed computational systems

Structure of the Course: Main Topics

Generality on distributed systems

- Basic problems and definitions
- Software architectures

Issues of distributed systems

- Communication
- Naming
- Synchronisation
- Consistency & replication
- Fault tolerance

Main sorts of distributed systems

- Distributed object-based systems
- Distributed web-based systems
- Distributed coordination-based systems

Material of the Course: Main Book

[Tanenbaum and van Steen, 2007a]

Tanenbaum, A. S. and van Steen, M. (2008)
Distributed Systems. Principles and Paradigms
Pearson Prentice Hall, Upper Saddle River, NJ, USA, 2nd edition.

[Tanenbaum and van Steen, 2007b]

Tanenbaum, A. S. and van Steen, M. (2008)
Sistemi Distribuiti
Pearson Education Italia, Torino, Italia, 2^a edizione.

This book represents the main guide throughout the first two parts of the course—Basics & Issues

Material of the Course: Slides

http://apice.unibo.it/xwiki/bin/view/Courses/SdLa0809

- Slides will be available from the course's web site
- Along with any additional information—e.g., related literature

The last part of the course – on the three main sorts of distributed systems – will contain several references to the Tanenbaum & van Steen book chapters, but will mainly evolve according to a different perspective, reported on the course's slide.

Attitude toward the Course

Attending lessons is important

- The course is mostly new
- A lot of "implicit knowledge" is transferred orally

Participating to lessons is important as well

- Just pretending to listen & to agree with professor does not help so much...
- Interacting throughout lessons makes them more effective

Material should suffice, anyway

- For those who have problems attending lessons
- Or, for those who just hate the Professor's voice / face / slides / attitude / whatever

Registering to the Course

Distribution lists...

- are provided for free by the Alma Mater Studiorum
- they mostly work
- we will use them here

Please register soon...

- to the list `ANDREA.OMICINI.SD-LA-0809`
- using password `0809SDLA`
- like, say, *today*.

The Exam

Oral Examination

- Typically, three questions
  - possibly with some code to be read, understood, or written
- Projects are not excluded a priori
  - but should be carefully selected, motivated, and supported
  - in case, the discussion of the project replaces the three questions
  - however, if the project is not completed on time, the exam switches back to oral examination

Registering to UniWex lists is required...

- ...in order to be examined

Bibliography

Tanenbaum, A. S. and van Steen, M. (2007a).
Distributed Systems. Principles and Paradigms.
Pearson Prentice Hall, Upper Saddle River, NJ, USA, 2nd edition.

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